

Ap Biology Unit 5

genetics

mendelian genetics
non-mendelian genetics

chromosomal inheritance
environment effects

COMMON ANCESTRY

- DNA and RNA carry genetic information
- Proteomes are found in all life
- Genetic code is shared by all living organisms
- Metabolic pathways are conserved across domains

VOCABULARY

- Character - heritable feature (gene) that varies
- Dominant - determines appearance
- Recessive - no noticeable effect
- Hybrid - cross of two true-breeding
- True Breeding - produces offspring w/ only the same variety as the parent
- ALLELES - alternative versions of genes
ex: purple flower color vs. white
- Fertilization - meeting of two haploid gametes, restoring diploid # of chromosomes
- Linkage Map - genetic map of chromosome based on combination frequencies
- Linked genes - genes located on the same chromosome, usually inherited together

Law of Segregation

two alleles segregate during gamete formation and end up in different gametes

Law of Probability

* Rules of Probability can be applied to analyze how single gene traits travel from the parent to offspring
* 3:1 ratio in the second generation

Monohybrid Cross $DdAa \times DdAa$

$9:3:3:1$

* allowed by law of independent assortment

Sex-linked Inheritance

Female $X^H X^h$
Male $X^H Y$

$X^H X^H$ $X^H X^h$ $X^h X^H$ $X^h X^h$
 $X^H Y$ $X^h Y$

* Some disorders are caused by **RECESSIVE** alleles on the X-chromosome
= affected
= carrier

* For recessive X-linked trait to be shown:
1) female needs 2 copies of allele (homozygous)
2) male needs 1 copy of allele (heterozygous)
→ sex-linked recessive disorders are more common in males than in females

* adjacent genes on the same chromosome can appear genetically linked
→ Probability of segregation can be used to create genetic maps

ENVIRONMENTAL EFFECTS

- Same genotype can result in different phenotypes based on the environment
- Phenotypic plasticity - individuals of same genotype show different phenotypes in different environments
- Plasticity Example: Arctic fox has 2 coats - white in winter, brown in summer
- decide in daylight changes gene expression pathway
- UV rays → higher UV rays lead to production of darker melanin (tanning)

Chromosomal inheritance

- Segregation, independent assortment of chromosomes and recombination create genetic variation
- Large scale mutation - one whole chromosome is switched out another (ex: trisomy 21)
- Deletion - segment is removed
- Duplication - segment is repeated
- Inversion - segment is reversed
- Translocation - exchange of segments
- Large change in gene regulation

EXPRESSION

gene alone does not tell the phenotypic expression of gene at hand told

Example: Labrador coat color (pigment, to brown)

Proteins

involve phenotypic effects, base

alter gene multiple expression of hereditary changes

Genetic Variation

single phenotypic character is

affected by 2+ genes → skin color

Pinkish □ = unaffected ■ = affected

○ = recessive □ = mixed

Conquer AP Biology Unit 5: A Comprehensive Guide to Genetics

Are you staring down the barrel of AP Biology Unit 5, feeling overwhelmed by the complexities of heredity, molecular genetics, and biotechnology? Don't worry, you're not alone! This unit is notoriously challenging, covering a vast amount of material in a short timeframe. This comprehensive guide breaks down AP Biology Unit 5 into manageable chunks, providing you with the strategies, key concepts, and resources you need to ace this crucial section of the course. We'll cover everything from Mendelian genetics to gene regulation, ensuring you're well-prepared for the exam.

Understanding Mendelian Genetics: The Foundation of Inheritance (H2)

This section lays the groundwork for the entire unit. Mastering Mendelian genetics is essential to understanding more complex genetic concepts. We'll explore:

Mendel's Laws: A thorough review of the Law of Segregation and the Law of Independent Assortment, including practice problems to solidify your understanding. We'll dissect the concepts of homozygous and heterozygous genotypes, dominant and recessive alleles, and phenotypic ratios.

Punnett Squares and Probability: Learn how to effectively use Punnett squares to predict the genotypes and phenotypes of offspring, moving beyond basic monohybrid and dihybrid crosses to more challenging scenarios involving linked genes and sex-linked traits. Understanding probability is crucial for accurate predictions.

Beyond the Basics: We'll delve into exceptions to Mendelian inheritance, including incomplete dominance, codominance, multiple alleles, pleiotropy, and epistasis. These concepts often trip students up, so a clear understanding is vital.

Molecular Genetics: Delving into the DNA Code (H2)

This section moves beyond the phenotypic level to explore the molecular mechanisms underlying inheritance. Key topics include:

DNA Structure and Replication: A detailed overview of DNA's double helix structure, including the roles of nucleotides, hydrogen bonds, and antiparallel strands. We'll examine the process of DNA replication, including the enzymes involved and the significance of semi-conservative replication.

Transcription and Translation: Understanding how genetic information flows from DNA to RNA to protein is crucial. We'll examine the roles of mRNA, tRNA, rRNA, and the ribosome in protein synthesis, including the processes of transcription and translation. We'll also explore the genetic code and how codons determine amino acid sequences.

Mutations and Their Effects: Learn about various types of mutations (point mutations, frameshift mutations, chromosomal mutations) and their impact on protein structure and function. We'll explore the mechanisms of DNA repair and the significance of mutations in evolution and disease.

Gene Regulation: Controlling Gene Expression (H2)

Understanding how gene expression is regulated is a key concept in AP Biology. This section will cover:

Prokaryotic Gene Regulation (Operons): Explore the lac operon and trp operon as examples of how prokaryotes control gene expression in response to environmental conditions. Understanding the concepts of inducible and repressible operons is vital.

Eukaryotic Gene Regulation: This section is more complex, covering a range of mechanisms including transcriptional regulation (promoters, enhancers, silencers, transcription factors), post-transcriptional regulation (RNA processing, RNA interference), and translational regulation.

Epigenetics: A brief introduction to epigenetics and how environmental factors can influence gene expression without altering the DNA sequence itself.

Biotechnology: Applying Genetic Knowledge (H2)

This section explores the practical applications of genetic knowledge. Key topics include:

Recombinant DNA Technology: Learn about techniques like restriction enzymes, gene cloning, and polymerase chain reaction (PCR). Understanding how these techniques are used to manipulate DNA is essential.

Gel Electrophoresis: Learn how gel electrophoresis is used to separate DNA fragments based on size and charge.

Applications of Biotechnology: We'll explore various applications of biotechnology, such as gene therapy, genetic engineering in agriculture, and forensic science.

Putting it All Together: Strategies for Success (H2)

Practice Problems: Consistent practice is key to mastering AP Biology Unit 5. Use practice problems from your textbook, online resources, and past AP exams to test your understanding.

Review Sessions: Form study groups with classmates to review concepts and practice problems together.

Utilize Online Resources: There are numerous online resources available to help you learn, such as Khan Academy, Crash Course Biology, and various AP Biology review books.

Conclusion:

Conquering AP Biology Unit 5 requires dedication, consistent effort, and a strategic approach. By breaking down the material into manageable sections, focusing on key concepts, and utilizing effective study strategies, you can significantly improve your understanding and achieve your desired score. Remember to practice consistently and seek help when needed. Good luck!

Frequently Asked Questions (FAQs):

1. What are the most important formulas to know for AP Biology Unit 5? While there aren't many explicit formulas, a strong understanding of probability and ratios (for Mendelian genetics) is crucial.
2. How can I best visualize complex genetic processes like transcription and translation? Use

diagrams, animations, and flashcards to help you visualize these processes.

3. What resources are best for practicing AP Biology Unit 5 material? Past AP Biology exams, online quizzes, and your textbook's practice problems are all excellent resources.

4. Is it essential to memorize every enzyme involved in DNA replication and transcription? While understanding the roles of key enzymes is important, focusing on the overall processes is more crucial than memorizing every single enzyme.

5. How can I improve my ability to solve complex genetics problems? Practice regularly, break down problems step-by-step, and seek help when you get stuck. Working with a study group can be particularly helpful.

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